

THE EMBIOPTERA OF NEW GUINEA

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Aside from a few records of immature specimens, the only previously known embiopteron from New Guinea was *Oligotoma albertisi* Navás, described in 1930. Recently, the writer had an opportunity to collect specimens of this order in three widely separated areas along the northeast coast of this island. The fact that seven new species were obtained in limited coastal environments, and that four of these were found in one region, indicates that New Guinea must be rich in species awaiting discovery.

Specimens were obtained by first locating their silken tunnels spun on the bark of coconut palms and forest trees. The usual location of these tunnels is along the contact point of arboreal vines, in bark crevices, under bark flakes or lichens, among roots of epiphytic plants, and on the under surfaces of branches and logs. Habitats along the sea shore seem to be preferred by certain species to those a few yards or more inland. Some species may produce a conspicuous matting of tunnels occupied by a large number of individuals, others only inconspicuous, individual colonies. Tunnels produced by spiders or moths may closely resemble, and be confused with Embioptera activity. Because of the great amount of cover and the profusion of potential habitats in tropical forests, a search in the expected places for colonies may not yield results except after prolonged patience.

Mature males, obtained by carefully dissecting the tunnels, may be killed and preserved in 70% alcohol in the field. However, all immature specimens obtained and females should be transferred alive to large, cotton-plugged test tubes partially filled with crumbled bark or other habitat material. The Embioptera will quickly spin new tunnels in captivity and the tubes can serve as cultures from which an indefinite number of mature males, indispensable for systematic study, may be obtained. The cultures need only be kept moderately moist and enlarged as the populations increase. The bark, lichens, and moss serve as food.

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The nine known New Guinea species are members of the genus *Oligotoma* wherein they are a part of the large group of species related to *borneënsis* Hagen (= *vosseleri* Krauss). The male genitalic characters in this group are relatively uniform but valuable supporting specific distinctions may be found in mandibular and head structure, size, and in coloration. Color characters of post-teneral individuals, underestimated by Davis (1940), deserve fuller consideration. They are very useful in at least the preliminary separation of species, but should not become the sole characterization of new species.

GENERAL EXPLANATION OF FIGURES

The drawings are based on camera lucida outlines of specimens treated in KOH and mounted in balsam. Most setae, indications of pattern, and relative degree of sclerotization have been omitted. Membranous areas are represented by stippling. In the figures of the head the mandibles are often shown spread apart; the palpi, flagellar antennal segments and facets of the eyes have been omitted. No attempt has been made to adopt a uniform scale. Explanation of symbols: 9 = ninth abdominal tergite, 10 L = left hemitergite and 10 R = right hemitergite of tenth abdominal segment. 10 LP = process of 10 L; 10 RP₁ and 10 RP₂ = processes of 10 R. HP = process of hypandrium, LPPT = left paraproct, LC₁ = basal segment of left cercus, LCB = left cercus-basipodite.

KEY TO SPECIES OF NEW GUINEA EMBIOPTERA

Mature Males

1. Mandibles without inner-basal excisions; eyes very large, separated by interspace less than one-half an eye-width wide; left paraproct (LPPT) not sclerotized; basal segment of left cercus nearly cylindrical, not thickened distad; size small (body length 6.5 mm.) (fig. 8).....*oculata*
- . Mandibles with distinct inner-basal excision; eyes moderate to small sized, interspace at least three-fourths an eye-width wide; left paraproct sclerotized; basal segment of left cercus noticeably to strongly swollen distad; size small to large (body length 8 to 12 mm.).....2
2. Left mandible with the two distal teeth fused; process of left hemitergite of tenth abdominal tergite (10 LP) with a minute but distinct spine on outer margin near apex. (fig. 7).....*mandibulata*
- . Left mandible with three distinct, separate, acutely pointed distal teeth; left tergal process (10 LP) without subapical spine....3

3. Mandibles with bases very broad, inner basal margins sharply, obtusely angulate, outer dorsal margins strongly, acutely elevated (fig. 1).....*borneënsis*
- Mandibles not exceptionally broad basally, inner basal margins broadly rounded, outer dorsal margins not strongly elevated...4
4. Head color contrastingly darker than remainder of body, or at least the prothorax.....5
- Head and body nearly unicolorous, prothorax not lighter than pterothorax.....7
5. Body and legs pale yellowish orange in color throughout in striking contrast to dark brown wings and blackish brown head...*aurea*
- Body and legs mostly light to dark brown, wings not darker than body.....6
6. Prothorax pale yellow in strong contrast to the dark brown legs, pterothorax, and abdomen; wings as dark as pterothorax, hyaline stripes very narrow and sharply defined; eyes relatively small, separated by an interspace more than two eye-widths wide; size large (length 11.0 mm.).....*maritima*²
- Prothorax light brown, not noticeably lighter in color than that of legs, pterothorax, and abdomen; wings and pterothorax nearly unicolorous, hyaline stripes broad and poorly defined; eyes large, interspace one eye-width wide; size small (8 mm.).....*hollandia*
7. Eyes large, inflated, interspace less than one eye-width wide; head narrow (fig. 2).....*davisi*
- Eyes rather small; interspace nearly two eye-widths wide; head broad (fig. 3).....*brunnea*

Mature Females³

1. Coxae and trochanters of middle and hind legs whitish, strongly contrasted by the dark femora and thorax.....2
- Legs unicolorous3
2. Tibiae and tarsi of middle and hind legs whitish; strongly contrasted by the dark brown femora.....*oculata*
- Tibiae, except for short basal whitish area, as darkly colored as femora; tarsi golden brown.....*mandibulata*
3. Head distinctly darker than prothorax.....4
- Head and prothorax unicolorous.....5
4. Size larger, 9 to 11 mm. Liki and Wakde Islands.....*aurea*
- Size smaller, 7 to 9 mm. Humboldt Bay.....*hollandia*
5. Head, prothorax, and legs, medium to golden-brown; thorax and abdomen dark brown.....*maritima*
- Unicolorous dark brown throughout⁴.....*davisi*

²*Albertisi* Navás would apparently key out to *maritima* but at least differs in the nature of the apex of the left paraproot which is sharply hooked in the latter and obtusely tapered and scarcely curved outward in *albertisi*.

³The females of *albertisi* Navás and *borneënsis* Hagen are unknown.

⁴Females of *brunnea* will probably key out here but available specimens are **general** and therefore not included.

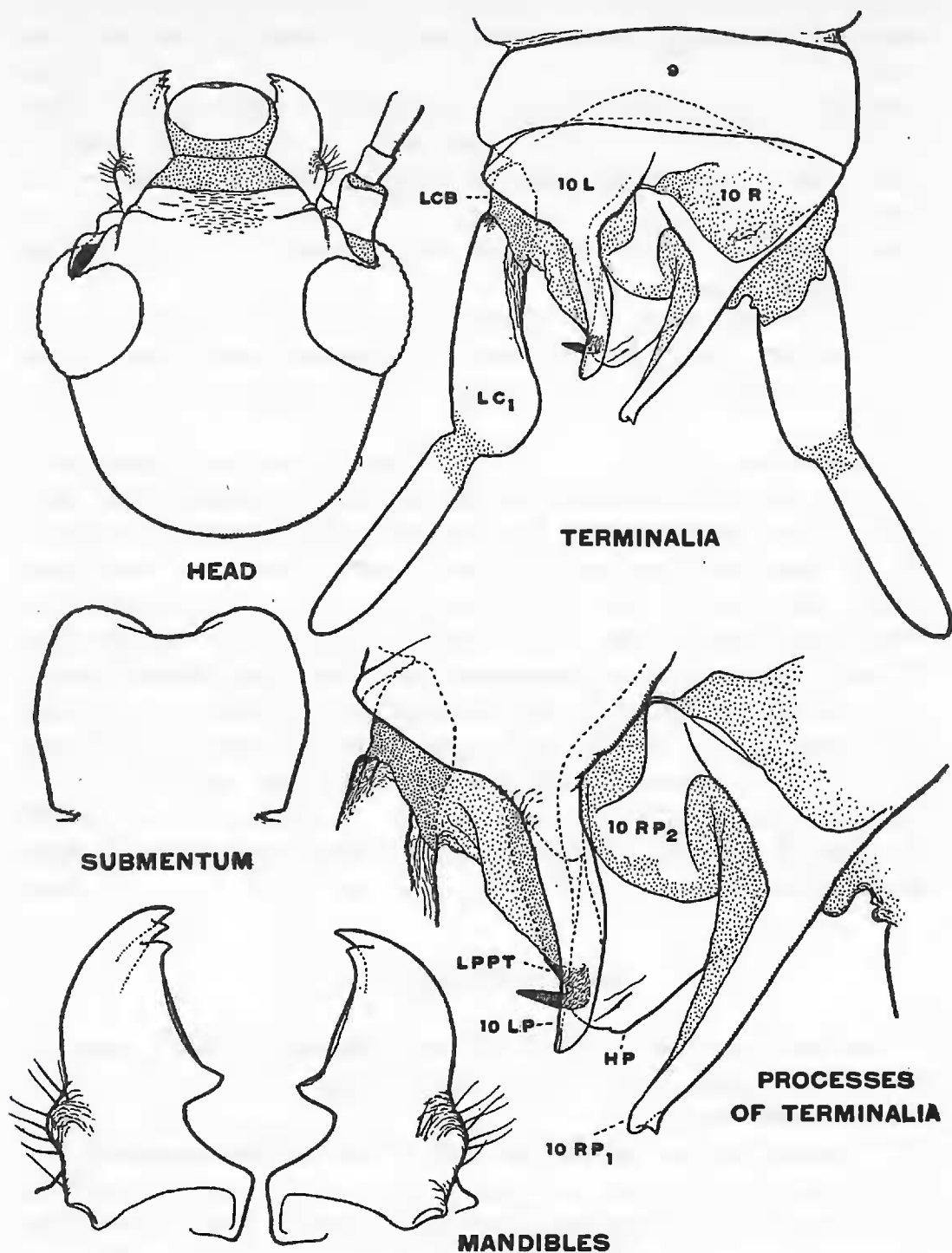


Figure 1. *Oligotoma borneënsis* Hagen. Salient characters of mature male based on specimen from Ta Han, Hainan. Explanation of symbols on page 98.

(1) OLIGOTOMA BORNEËNSIS Hagen

A bibliography, redescription, and figures of this common species have been published recently by the writer (1943) and these need not be repeated here. The species is known from South China, the Philippines, through Indonesia, and the Malay Peninsula where

males are frequently collected at light, often together with those of *Oligotoma humbertiana* (Saussure). Because its range is apparently confined to populated coastal areas, it seems evident that the species has been spread by man in the course of ancient and modern commerce. It may be separated from all other known New Guinea species by its peculiar mandibular characters as figured.

New Guinea record: Six males from Sekroe, N. W. New Guinea, acq. 1898 (N. Schadler) (Leiden Museum Collection).

I wish to thank Dr. H. C. Blöte of the Rijksmuseum van Natuurlijke Historie for the privilege of studying these specimens.

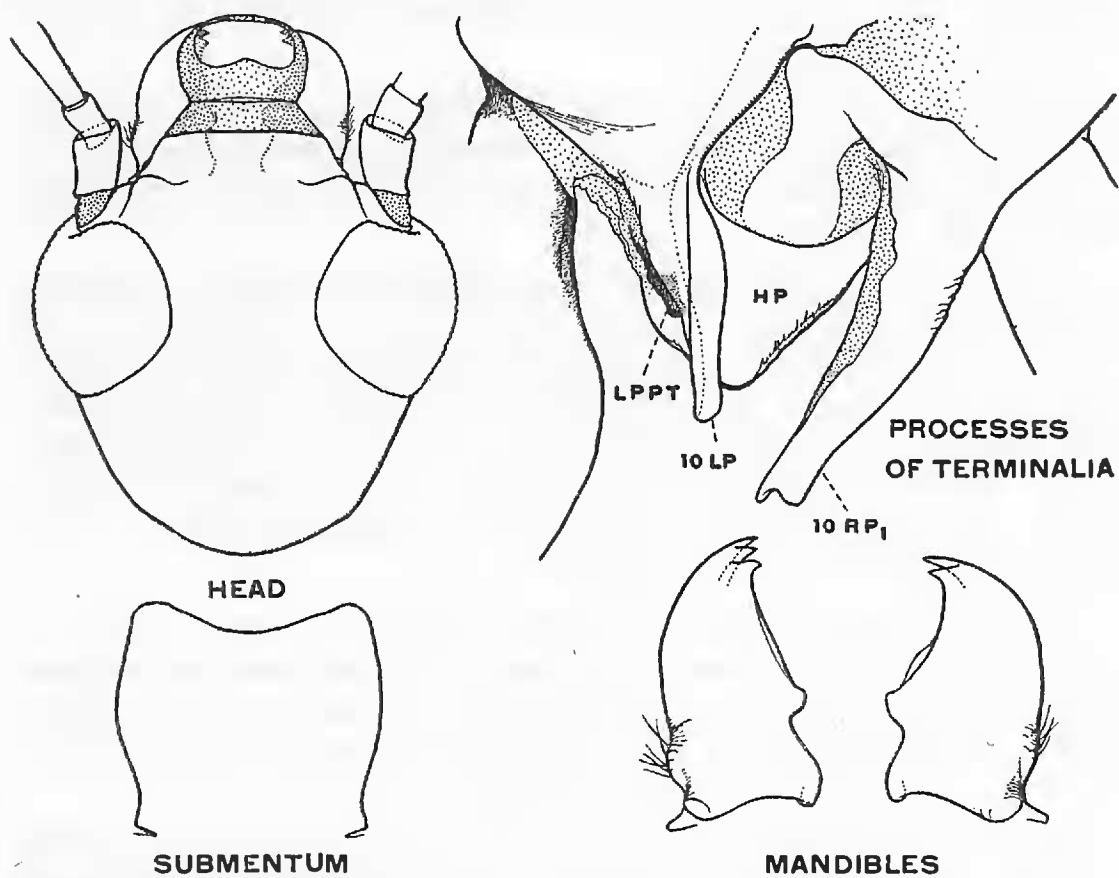


Figure 2. *Oligotoma davisi*, new species. Salient characters of holotype male. Explanation of symbols on page 98.

(2) *Oligotoma davisi* Ross, new species

Male. General Color: body, legs, and wings uniform medium brown throughout; head slightly darker. *Dimensions*: relatively large, body length 8.5 mm.; forewing length 6.3 mm., breadth 1.75 mm.

Head with form as illustrated. Cranium narrow; area behind eyes dark brown, becoming yellowish brown between eyes, thence dark brown in clypeal region⁵; ventrally dark brown except for

⁵This bicolorous condition only visible in KOH-cleared specimens.

lighter ring around margins of occipital foramen; occipital foramen rounded anteriorly; width of gular bridge equal to submentum length. Eyes very large, inflated, facets very large. Antennae with basal segment dark chocolate-brown, other segments tan, number incomplete. Labrum light brown; mandibles golden yellow except for reddish amber inner-apical margins; palpi dark brown; submentum light golden brown, much lighter than posterior cranial color, outline as figured.

Thorax without specific structural features, medium brown throughout, pleurites darker. *Legs* with all segments unicolorous medium brown, the forelegs somewhat darker. Wings without specific venational features, medium brown throughout but appearing relatively light because of broad unpigmented intervenal stripes which are wider than one-third the distance between veins and have very weak, suffused margins.

Abdomen paler than thorax; terminalia with structure and color almost identical to that of *brunnea* more fully described below.

Female (in alcohol) rather unicolorous blackish brown throughout. Length 11.0 mm.

Head with cranium blackish, chocolate-brown dorsally with two faint suffused pale brown areas between eyes, no evidence of basal pattern; ventrally paler around occipital foramen and gular bridge. Antennae with basal segment as dark as cranium, second segment light brown, remaining segments pale straw-yellow; becoming paler distad; number incomplete (16 present). Labrum colored as cranium; other mouthparts, except mandibles and submentum, dark brown; submentum blackish brown.

Thorax blackish brown dorsally, somewhat lighter ventrally; membranous areas between pronotum and mesonotal acrotergite and between mesonotum and metanotal acrotergite white. *Legs* with all segments dark brown, tarsi paler; membranous area between femur and tibia of all legs whitish.

Abdomen with tergites blackish brown, pleurites and sternites (except terminal) medium brown, membranous areas and posterior margins of tergites rufous light brown; terminal tergites darker, paragenital sternites dark brown without characteristic pattern. Cerci blackish brown.

Holotype male, (No. 5850, Calif. Acad. Sci., Ent.), on slide, and *allotype* female, (No. 5851, Calif. Acad. Sci., Ent.), in alcohol, collected by the writer at TOEM, MAFFIN BAY, DUTCH NEW GUINEA July 20, 1944.

Paratypes: fifteen males (14 on slides, one in alcohol) and eight females on slides and in alcohol from the type locality but collected, or matured in cultures, on various dates from June 20 to September 20, 1944. Deposited in the U. S. National Museum, Museum of

Comparative Zoology, Harvard, British Museum (Natural History), and in the writer's collection.

Biology: Silken colonies were found on the trunks of shaded forest trees. A favored situation is along the contact point of large vines growing on the tree. This is the most abundant of the forest species at Maffin Bay.

Relationships: Males of *davisi*, and its close relative, *brunnea*, described below, may be superficially distinguished from the other known New Guinea Embioptera by their rather uniform color in both sexes, the other species having a paler prothorax, darker wings or bicolourous legs. The male of *davisi* may be separated from that of *brunnea* by its smaller, narrower cranium with very large eyes and its darker color. This species is named in honor of the late Australian embiopterist, Consett Davis, who lost his life in a wartime plane crash in New Guinea.

(3) *Oligotoma brunnea* Ross, new species

Male. General color: body, legs and wings rather uniform medium brown throughout; head somewhat yellowish-brown. *Dimensions:* relatively large; body length 10.7 mm.; forewing length 7.0 mm., breadth 1.8 mm.

Head with form as illustrated. Cranium yellowish-brown becoming darker at sides; width of gular bridge equal to length of submentum. Eyes relatively small and widely spaced, facets prominent. Antennae with basal segment dark chocolate-brown in strong contrast to lighter cranial color; other segments at first medium brown but gradually becoming pale tan distad; only fourteen segments present, remainder broken off. Labrum medium brown; mandibles golden yellow, inner margins reddish amber; palpi dark brown; submentum dark golden brown, much darker than cranium, outline as figured.

Thorax without specific structural features, medium brown throughout, pleurites somewhat darker. *Legs* with all segments medium brown. Wings without specific venational features, medium brown throughout; unpigmented intervenal stripes rather broad, width averaging one-fourth the distance between veins, margins rather suffused.

Abdomen similar in color to thorax, *terminalia* with structure as figured. Left hemitergite (10 L) of tenth segment medium brown with dark brown inner and outer margins, process (10 LP) golden brown; right hemitergite (10 R) pale brown, processes dark chocolate-brown basally becoming lighter distad, extreme apex of 10 RP₁ golden-yellow. Ninth sternite pale brown; base of process (HP)

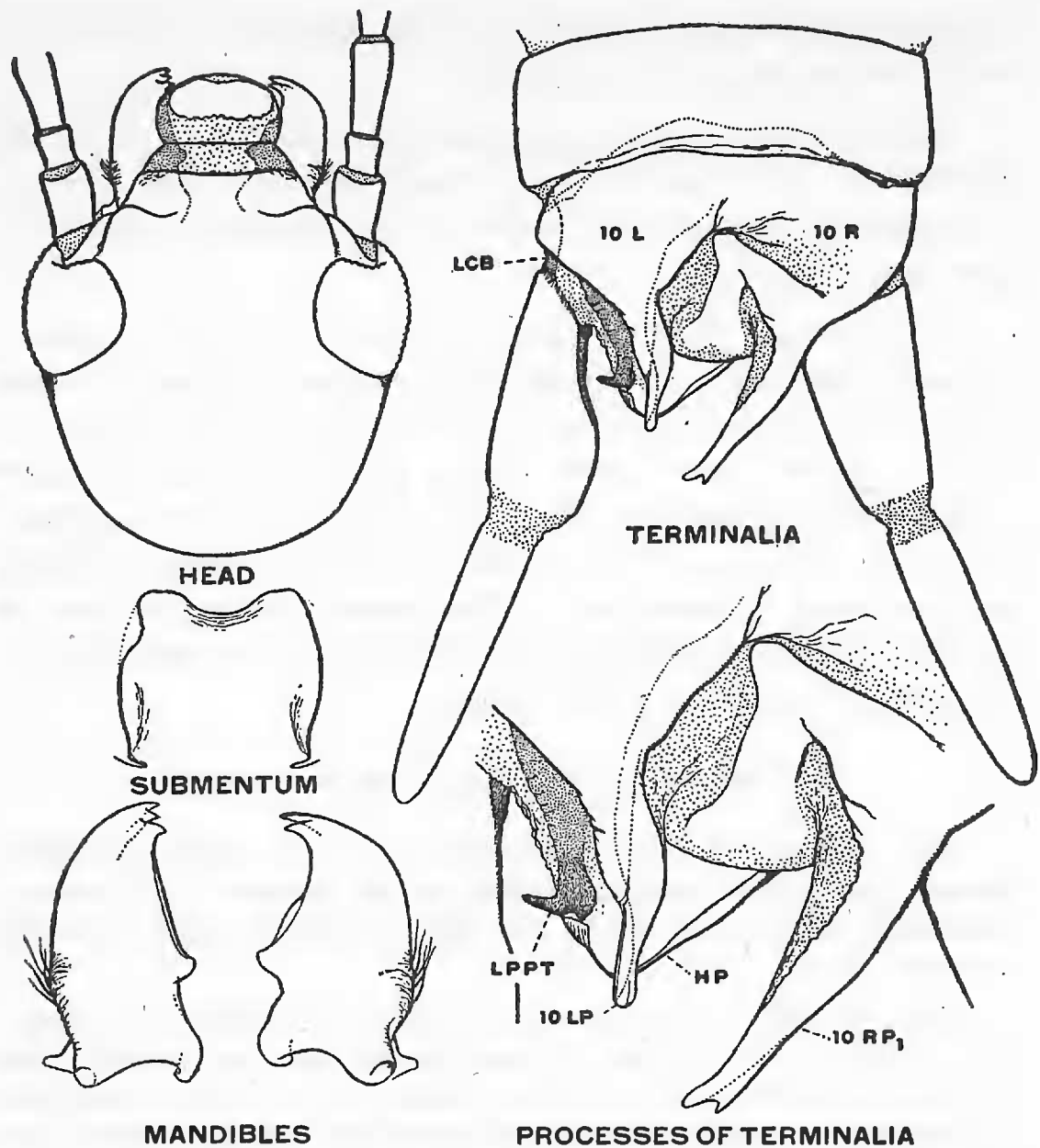


Figure 3. *Oligotoma brunnea*, new species. Salient characters of holotype male. Explanation of symbols on page 98.

transversely rugulose, darker, apex of process with prominent setae; left paraproct (LPPT) light brown, setose, sclerotized apex formed as an obtuse hook with an irregular base, color golden brown; left cercus-basipodite (LCB) very dark chocolate-brown, fused to base of left cercus; basal segment of left cercus medium brown with dark inner margin, terminal segment and segments of right cercus light brown.

Female: The only associated female is teneral and therefore unfit for description. Its characters should be very similar to those of *davisi* but its color may prove to be lighter.

Holotype: male, (No. 5854, Calif. Acad. Sci., Ent.), on slide, collected by the writer at GUSIKA, 15 miles north of FINSCHHAFEN, N. E. NEW GUINEA, April, 1944.

Paratypes: three topotypic males deposited in the U. S. National Museum and in the writer's collection.

Biology: Collected in silken tunnels spun on the exposed under surface of a large fallen tree near a forest creek. Embioptera were rarely found in the forest area at Gusika but were abundant (*maritima*) on the bark of trees growing on the coral cliffs along the ocean shore.

Relationships: Discussed under *davisi*. Further collecting may reveal that the two species, *brunnea* and *davisi*, belong to a race complex. For the present they are regarded as species because of the marked, consistent differences in head form and color.

(4) OLIGOTOMA ALBERTISI Navás

Oligotoma albertisi Navás, 1930, Broteria, Serie Zoologica, 26; 20, fig. 2; Davis, 1940, Proc. Linn. Soc. N.S.W., 65; 375, figs. 38-42.

Holotype: Male, deposited in Genoa Museum, Italy.

Type data: Katau, New Guinea, 1875 (L. M. Albertis).

Davis' recent redescription and illustrations of the type of this species are insufficient in the light of present knowledge to place this species with certainty. It is probably distinct from those described at this time but appears to be most similar to *maritima* by virtue of its head and eye form, and the pale prothorax. It differs, however, in having the left paraproct (LPPT) blunt and unhooked and in the longer left tergal process (10 LP).

It is unfortunate that the nature of the mandibles and details of color were not made known by Davis. His suggestion that *albertisi* might prove to be a subspecies of *borneënsis* does not seem to be well founded.

(5) *Oligotoma maritima* Ross, new species

Male. General color: Head dark chocolate-brown, much darker than remainder of body; pterothorax, legs, and abdomen medium brown; wings dark brown; prothorax yellowish, contrastingly lighter than any other portion of specimen. *Dimensions*: large; body length 10.4 mm.; forewing length 7.0 mm., breadth 1.9 mm.

Head with form as illustrated. Cranium dark chocolate-brown, somewhat lighter between eyes dorsally and ventrally around inner margins of eyes, dark around margins of occipital foramen; gular bridge width a little more than half of submentum-length. Eyes rather small, widely spaced, with small facets. Antennae with basal three segments as dark as cranium, remaining segments becoming

increasingly lighter brown distad, finally straw-yellow; twenty-two segments present in both antennae (probably complete). Labrum dark brown; mandibles with structure as figured, golden-brown with apical teeth and inner margins reddish-brown; palpi dark brown; submentum with outline as figured, largely dark, chocolate-brown with lateral margins blending to golden-brown.

Thorax without specific structural features; prothorax with dorsum and sides pale straw-yellow, prosternum light brown; pterothorax with scutae medium brown anteriorly and posteriorly, pale medially, pleural sclerites dark brown, sternites medium brown. *Legs* with all segments medium brown, prothoracic legs somewhat darker. Wings without specific venational features; uniformly dark brown with very narrow unpigmented intervenal stripes, these averaging only one-sixth the distance between veins in width, margins regular and sharply defined.

Abdomen medium brown throughout. *Terminalia* with structure as figured; tenth tergite dark brown, right hemitergite (10 R) pale; left process (10 LP) dark brown medially, tan along margins and at apex; processes of right hemitergite dark brown, 10 RP, somewhat golden-brown at extreme apex; ninth sternite medium brown, process (HP) tan; left paraproct (LPPT) medium brown, sclerotic hook golden-brown; left cercus-basipodite (LCB) dark brown, apparently fused to base of left cercus; cerci medium brown, basal segment of left cercus slightly darker with dark brown inner margin.

Female (in alcohol) rather unicolorous medium brown throughout; thorax and head lighter, the abdomen darker. Length 14.0 mm.

Head with cranium amber-brown with lighter, characteristic embiopteroid basal pattern visible; ventrally paler amber-brown. Antennae with basal segment dark brown, second and third segments light brown, remainder light yellowish brown; 22 segments present. Labrum pale amber-brown; other mouthparts amber brown, stipes of maxilla and membranes light yellowish brown; submentum dark brown.

Thorax with pronotum dark amber-brown, other segments dark, mottled chocolate-brown; ventrally pale. *Legs* with femora and tibiae dark brown, other segments pale brown mottled with dark brown; membrane between femur and tibia pale.

Abdomen with tergites dark brown; becoming darker caudad; pleurites and sternites mottled yellowish brown; eighth sternite pale medially, dark brown at sides; ninth sternite with a pale basal and terminal triangular area, sides dark brown. Cerci dark brown mottled with small pale areas.

Holotype male (No. 5852, Calif. Acad. Sci., Ent.) and female (No. 5853, Calif. Acad. Sci., Ent.) on slides collected by the writer at GUSIKA, 15 miles north of FINSCHHAFEN, N. E. NEW GUINEA, April 16, 1944.

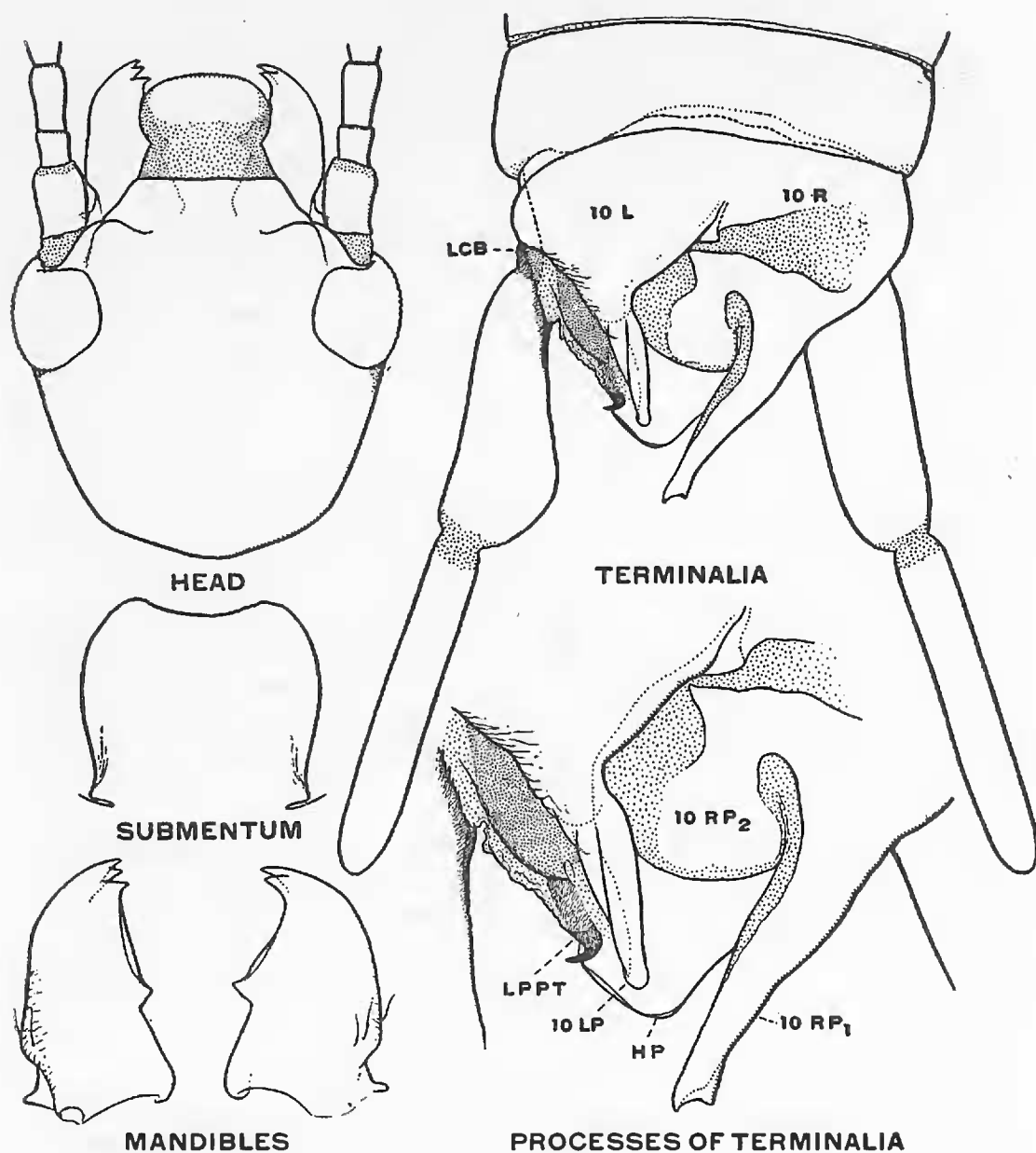


Figure 4. *Oligotoma maritima*, new species. Salient characters of holotype male. Explanation of symbols on page 98.

Paratypes: Twelve males (eleven on slides, one in alcohol) and a series of females on slides and in alcohol, all collected at the type locality during April and early May, 1944. Deposited in the U. S. National Museum, Museum of Comparative Zoology, Harvard, British Museum (Natural History), and in the writer's collection.

Biology: This species was found exclusively on the bark of dense low scrubby trees growing on coral sea cliffs. A few yards inland populations of the species disappeared. The colonies were found in the heavy shade on the outside smooth surface of the bark as well as in bark crevices. Often the colonies were very extensive and formed dense mats of silk that could be peeled off of the bark.

Relationships: Discussed under *aurea*.

(6) *Oligotoma hollandia* Ross, new species

Male. General color: head blackish-brown contrastingly darker than remainder of body, body, legs, and wings rather uniformly light brown, abdominal terminalia dark brown. *Dimensions:* small, body length 6.6 mm., forewing length 4.7 mm., breadth 1.3 mm.

Head with form as illustrated. Cranium blackish-brown throughout except along margins of occipital foramen where it is pale brown; foramen acutely triangulate in outline; gular bridge width one-third shorter than submentum length. Eyes large with prominent facets. Antennae with basal segment dark brown, second segment medium brown, remainder pale brown becoming somewhat darker distad, seventeen segments present in both antennae (probably incomplete). Labrum medium brown; mandibles with structure as figured, distal half golden-brown, basal half dark brown; palpi medium brown; submentum blackish-brown, outline as figured.

Thorax without specific structural features, light brown with pleurites and anterior promontory of scutae of pterothorax darker brown. *Legs* with all segments rather uniform light brown. Wings without specific venational features; light brown; unpigmented intervenal stripes averaging in width one-third the distance between veins, margins irregular.

Abdomen light brown with unpigmented medial area on tergites. *Terminalia* with structure as figured; tenth tergite dark brown; left process golden-yellow, right processes dark brown except extreme apex of 10 RP₁ which is golden yellow; ninth sternite (H) medium brown; left paraproct (LPPT) sclerotic, dark brown; left cercus-basipodite (LCB) dark brown, apparently fused to left cercus; cerci uniformly pigmented medium brown.

Female (in alcohol): body sclerites light brown with pale tan membranes, head dark brown, legs unicolorous. Length 8.0 mm.

Head with cranium dark chocolate-brown with two lighter suffused areas extending from eyes to middle third; ventrally medium brown, gula and margins of occipital foramen tan. Antenna with basal segment medium brown, others becoming lighter and tan distad. Mouthparts except mandibles light brown; submentum concolorous with venter of cranium.

Thoracic tergites light brown, pleura, sternum and legs pale tan.

Abdomen with tergites light brown at base but becoming medium brown caudad; sternites except paragenitals practically unpigmented pale tan; eighth sternite uniformly medium brown, ninth sternite slightly darker, cerci medium brown.

Holotype male (No. 5855, Calif. Acad. Sci., Ent.) and *allotype* female (No. 5856, Calif. Acad. Sci., Ent.) on slides collected by the writer at PIE BEACH, HUMBOLDT BAY (NEAR HOLLANDIA), DUTCH NEW GUINEA, May 23, 1944.

Paratypes: Eight males (seven on slides, one in alcohol) and a series of females on slides and in alcohol, all collected with the

holotype and allotype. Deposited in the U. S. National Museum, Museum of Comparative Zoology, Harvard, the British Museum (Natural History), and in the writer's collection.

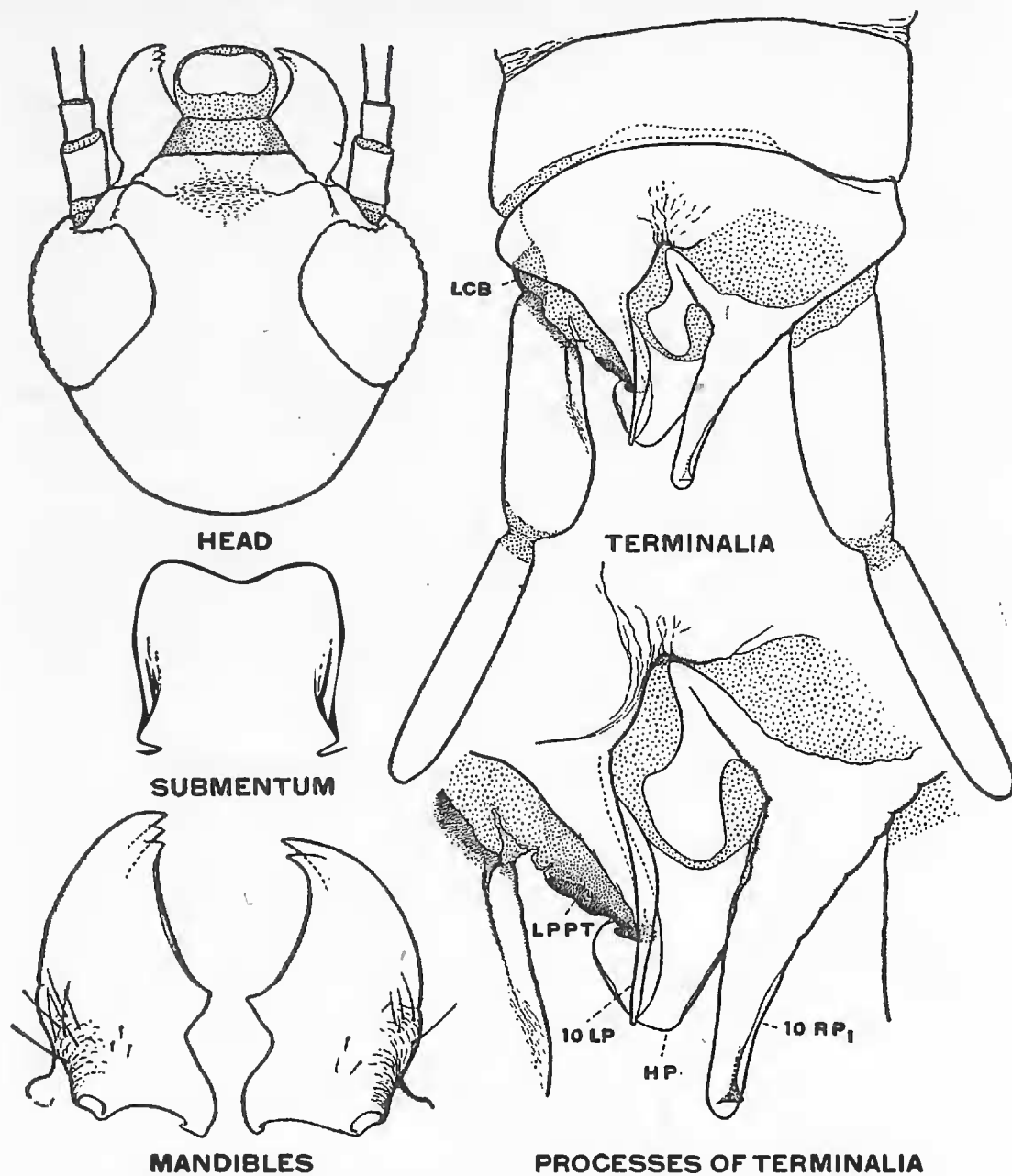


Figure 5. *Oligotoma hollandia*, new species. Salient characters of holotype male. Explanation of symbols on page 98.

Biology: The above specimens were collected during a brief stop on a very small rocky island connected with the mainland at low tide. The vegetation was native garden and secondary jungle scrub and the specimens were collected in the numerous colonies spun in bark crevices of coconut palms and breadfruit tree trunks. Females of a second and larger species were collected on the same island but no associated males were obtained. Its color indicates that it is *mandibulata*.

Relationships: Discussed under *aurea*.

(7) *Oligotoma aurea* Ross, new species

Male. General color: strikingly bicolorous. Head and wings blackish-brown and brown respectively in strong contrast to the body and legs which are pale golden-yellow. *Dimensions:* body length 8.6 mm., forewing length 5.7 mm., breadth 1.6 mm.

Head with form as illustrated. Cranium blackish-brown throughout except for a pale border around occipital foramen; foramen acutely triangulate in outline; width of gular bridge one-third shorter than submentum length. Eyes relatively small with small facets. Antennae with basal segment dark brown, second medium brown, segments III to X golden-yellow; remainder medium brown, becoming darker distally; number incomplete. Labrum dark brown; mandibles dark yellowish-amber with inner margins of apical half reddish-amber, basal margins dark brown; palpi medium brown; submentum same color as cranium but with lateral margins becoming pale brown, outline as figured.

Thorax without specific structural features; pale golden-yellow throughout, pleurites and anterior promitry of scutae of pterothorax slightly darker. Legs with all segments pale golden-yellow; terminal tarsal segments becoming tan. *Wings* without specific venational features; dark brown; unpigmented intervenal stripes very narrow, about one-tenth the distance between veins in width.

Abdomen pale golden-yellow except at apex. *Terminalia* with structure as figured; tenth tergite pale brown with posterior margins of hemitergites dark brown, left process dark brown at base becoming amber-yellow distad, right process (10 RP₁) dark brown except at extreme apex where it is amber-yellow, secondary process (10 RP₂) medium brown basally, pale yellowish-brown distally; ninth sternite medium brown, process (HP) yellowish; left paraproct (LPPT) medium brown, terminal sclerotic portion dark brown; left cercus-basipodite (LCB) very dark brown, apparently fused to base of left cercus; basal segment of left cercus medium brown with inner and basal margins dark brown, terminal segment light brown; right cercus light brown.

Female (in alcohol) with structure and coloring of *hollandia* but with pigmentation a degree darker. Suffused pale areas of cranium more extensive and nearly merging at middle and with a third inconspicuous small pale area within fork of postfrontal suture. Prothorax yellowish, paler than remainder of body. Length 10.0 mm.

Holotype male (No. 5857, Calif. Acad. Sci., Ent.) and *allotype* female (No. 5858, Calif. Acad. Sci., Ent.) in alcohol collected by the writer on LIKI ISLAND, DUTCH NEW GUINEA, August 18, 1944.

Paratypes five males and numerous females from Liki Island, August 18-20, 1944; fifteen males and twenty females, on slides and in alcohol from Wakde Island, May and June, 1944; and one male from Toem, Maffin Bay, September, 1944. Deposited in the U. S.

National Museum, Museum of Comparative Zoology, Harvard, the British Museum (Natural History), and in the writer's collection.

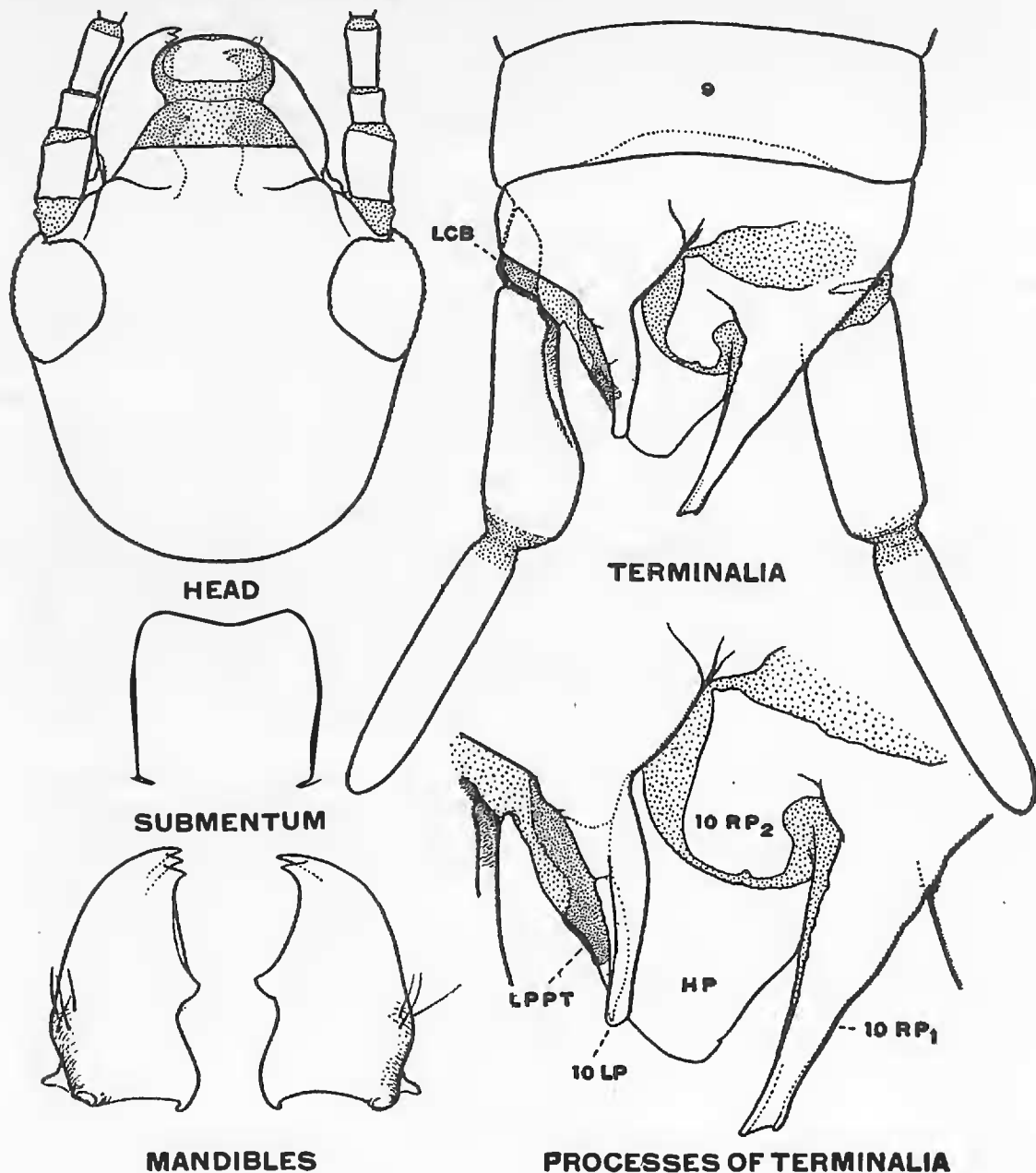


Figure 6. *Oligotoma aurea*, new species. Salient characters of holotype male. Explanation of symbols on page 98.

Biology: In spite of a careful search, only one specimen of this species was collected on the mainland. All other specimens were collected on Wakde Island (2½ miles off the coast from Toem) and Liki Island (about 20 miles north of Maffin Bay), where they were very abundant on the bark and in bark crevices of coconut palms. On Wakde Island the specimens were apparently unharmed by several days of intensive bombing and artillery fire which had leveled most of the cocoanut palms of the island about forty-eight hours before they were collected. The specimen from Toem was collected in an individual colony on the bark of a forest tree.

Relationships: *Aurea*, *hollandia*, and *maritima* form a very natural species group with almost identical terminalia structure, similar color tendencies, and similar biology. Sharp distinctions are found however in size, eye and cranial form and in color. These differences are constant in the series of each species.

(8) *Oligotoma mandibulata* Ross, new species

Male. General color: head dark brown, body and wings medium brown, legs medium brown except coxae and trochanters of mid and hind legs which are whitish. *Dimensions:* medium sized; body length 8.0 mm.; forewing length 5.2 mm, width 1.4 mm.

Head with form as figured. Cranium dark reddish-brown except for whitish area bordering occipital foramen and posterior margins of eyes ventrally; foramen obtusely angulate anteriorly; gular bridge as wide as submentum length. Eyes very large, inflated; facets prominent. Antennae with basal segment concolorous with cranium, second segment medium brown, remaining segments light tan. Labrum medium brown; mandibles with characteristic structure as figured, color golden-yellow with inner margins reddish-amber, outer angles pronounced, rugose, and brownish; palpi light brown; submentum uniformly dark brown.

Thorax structure as throughout the genus; light brown with pale, transverse area between meso- and metathorax and metathorax and abdomen. Prothoracic legs unicolorous light brown. Meso- and metathoracic legs light brown but with coxae and trochanters whitish. *Wings* with oligotomoid venation; color uniform, medium brown; intervenal unpigmented stripes narrow, their width one-fifth the distance between veins, margins regular but not sharply defined.

Abdominal terminalia with structure as figured; tenth tergite and processes medium brown, left process (10 LP) somewhat yellowish with a characteristic subterminal, minute outer spine; ninth sternite light brown, process (HP) nearly colorless; left paraproct (LPPT) medium brown, sclerotic terminal portion amber-brown; left cercus-basipodite (LCB) dark brown; cerci light brown.

Female (in alcohol) blackish brown except for whitish areas between thoracic segments and on leg segments. Length 8.5 mm.

Head with cranium blackish chocolate-brown with suffused paler area at each anterior tentorial pit and closely encircling eyes; ventrally with margins of occipital foramen, gula, and crassae pale brown. Antennae with all segments dark brown, intersegmental membranes whitish; 20 segments present (incomplete). Labrum dark brown; other mouthparts (except mandibles and submentum) dark to medium brown, submentum dark chocolate-brown.

Thorax blackish brown; with membranous areas and acrotergites between thoracic segments creamy white, pale condition continuing ventrally between meso- and metasternum only; pleurae blackish-brown; venter dark reddish-brown. Prothoracic legs with all segments as dark as thorax except tarsi which are medium brown, joint

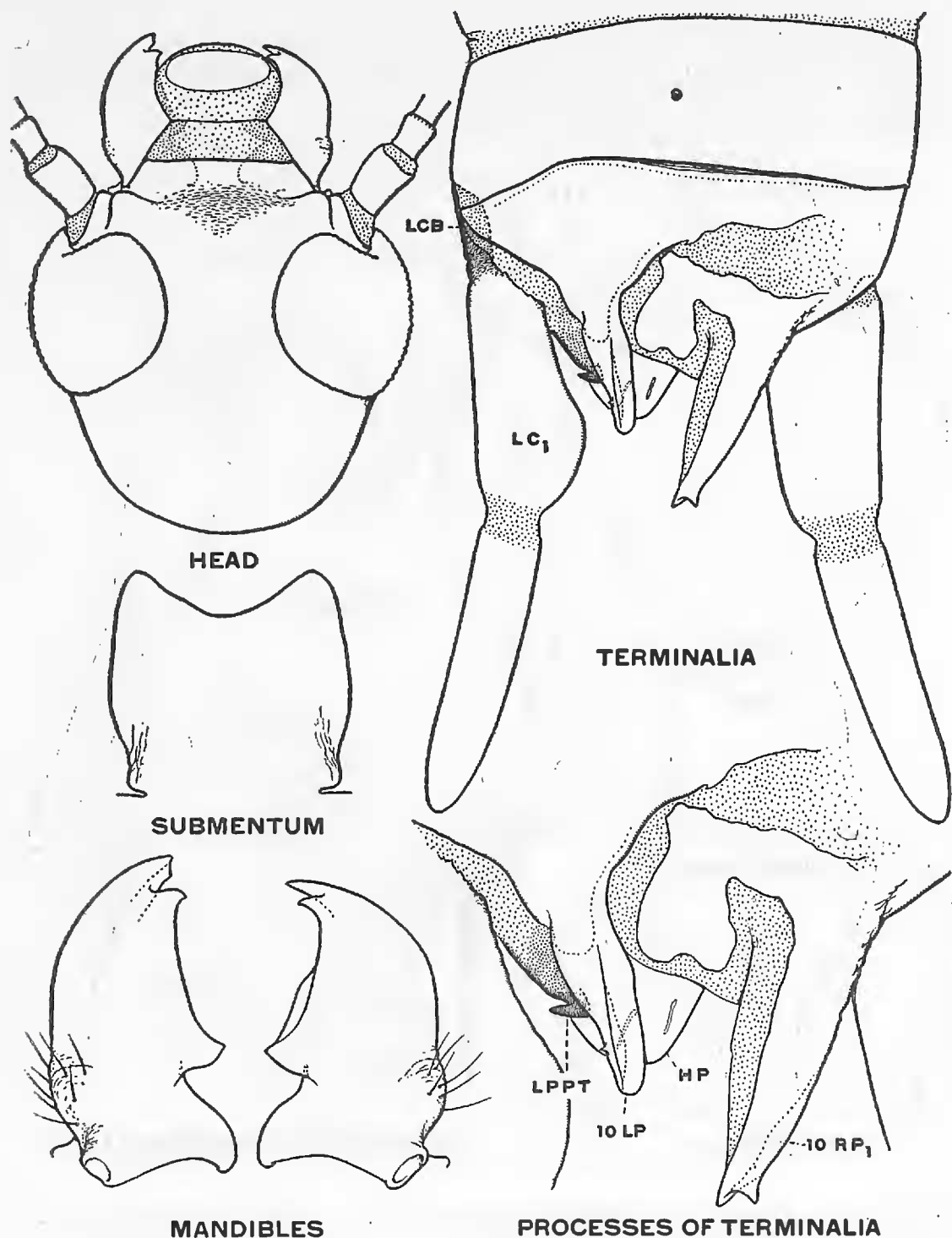


Figure 7. *Oligotoma mandibulata*, new species. Salient characters of holotype male. Explanation of symbols on page 98.

between femur and tibia white; other legs with femora as dark as thorax, tibiae somewhat lighter with basal fourth white, tarsi with basal segment brown and terminal segments tan, coxae and trochanters creamy white.

Abdomen with all tergites blackish-brown with posterior margins reddish-brown, membranes tan. Pleurites and sternites medium brown, membranes tan; eighth sternite with dark lateral areas; ninth sternite except for quadrate basal excision, dark chocolate-brown; cerci and paraprocts dark chocolate-brown.

Holotype male (No. 5859, Calif. Acad. Sci., Ent.) and *allotype* female (No. 5860), Calif. Acad. Sci., Ent.) on slides, collected at TOEM, MAFFIN BAY, DUTCH NEW GUINEA, July 20, 1944.

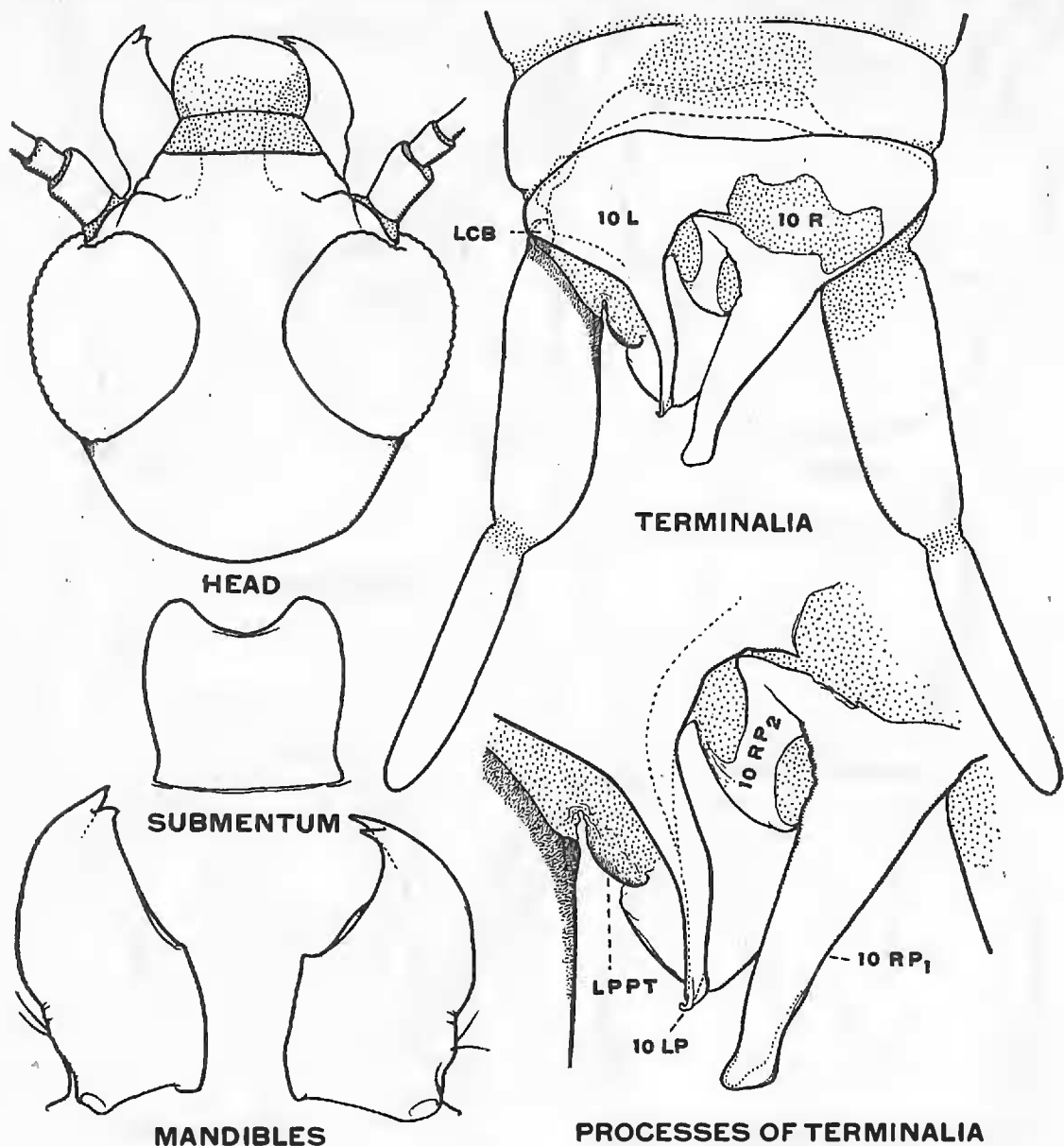


Figure 8. *Oligotoma oculata*, new species. Salient characters of holotype male. Explanation of symbols on page 98.

Paratypes six males on slides and one in alcohol, five females on slides and eight in alcohol, all collected at Toem, June to September, 1944. Deposited in the U. S. National Museum, Museum of Comparative Zoology, Harvard, the British Museum (Natural History), and in the writer's collection.

Biology: Usually found in individual nests spun in the bark crevices of coconut palms planted in groves but also collected on breadfruit tree bark and that of trees in virgin forest. Females apparently of this species were also collected at Humboldt Bay and near Finschhafen.

Relationships: *Mandibulata* stands apart from the other known New Guinea species by virtue of the following distinctive characters of the male: the deeply and acutely excised mandibles, the two apical teeth of the left mandible fused, the minute but distinct subterminal tooth of the left hemitergal process (10 LP), and the bicolorous mid and hind legs. The female may be recognized by its uniform blackish-brown color with the contrasting whitish coxae, trochanters, and tibial bases of the mid and hind legs.

(9) *Oligotoma oculata* Ross, new species

Male. General color: head dark brown, wings medium brown, body and legs various shades of medium brown. *Dimensions:* very small, body length 6.0 mm.; forewing length 4.5 mm., width 1.4 mm.

Head with form as illustrated. Cranium dark brown with setae relatively large; occipital foramen obtusely angulate; gular bridge slightly wider than submentum length. Eyes exceptionally large, separated by only a narrow cranial area, inflated with prominent facets. Antennae with basal segment as dark brown as cranium, second segment medium brown, remaining segments light brown; number incomplete. Labrum dark brown; mandibles with characteristic structure as figured; golden-yellow except along inner and apical margins which are reddish-amber; palpi medium brown; submentum and cranium concolorous.

Thorax with prothorax relatively small, otherwise formed as throughout the genus; color medium brown, prothorax somewhat darker. Prothoracic legs with all segments concolorous with prothorax; pterothoracic legs with coxae and trochanters whitish, other segments medium brown. *Wings* without specific venational features; color uniform medium brown, intervenal unpigmented stripes narrow, about one-seventh the distance between veins in width, margins regular and sharply defined.

Abdomen, except terminalia, light brown; terminalia with tenth tergite broadly produced beneath ninth tergite as an apodeme; left hemitergite (10 L) medium brown with dark brown inner and outer margins, process (10 LP) golden-yellow; right hemitergite (10 R) light brown, major process (10 RP₁) dark brown with apical third golden, secondary process (10 RP₂) very dark brown—especially at base; ninth sternite and process light brown; left paraproct (LPPT) unpigmented at base and only slightly so at apex—practically obsolete; left cercus-basipodite (LCB) and basal ring of left cercus very dark reddish-brown; except for dark inner margin of basal segment of left cercus, all segments of cerci are light-brown.

Female (in alcohol) blackish-brown except for contrasting whitish band between meso- and metathorax and certain whitish leg segments. Length 6.5 mm.

Head with cranium rather quadrate, blackish chocolate-brown with two large suffused pale areas between eyes and limited anteriorly by postfrontal suture; ventrally somewhat lighter chocolate-brown. Antennae with basal segment medium brown, other segments pale tan; 17 segments present (incomplete). Mouthparts, except mandibles and submentum, medium brown; submentum as dark as venter of cranium.

Thorax blackish chocolate-brown except for conspicuous creamy white band encircling area between meso- and metathorax. Prothoracic legs more or less unicolorous dark brown; other legs with only femora dark brown, all other segments creamy white.

Abdomen blackish chocolate-brown throughout, ninth sternite nearly black, cerci reddish-brown.

Holotype: male (No. 5861, Calif. Acad. Sci., Ent.) and *allotype* female (No. 5862, Calif. Acad. Sci., Ent.) on slides taken by the writer at ARARA, MAFFIN BAY, DUTCH NEW GUINEA, June 27, 1944.

Paratypes five males and seven females on slides from the type locality but matured in June. Deposited in the U. S. National Museum, Museum of Comparative Zoology, Harvard, the British Museum (Natural History), and in the writer's collection.

Biology: This minute species was collected in individual colonies spun inconspicuously among lichens and moss on the trunks of large trees or under exfoliating bark flakes of basally-buttressed, large trees. Both situations were in a dark, heavily shaded coastal rain forest about 300 yards inland from a sandy ocean beach.

Taxonomic remarks: *Oculata* is one of the most distinctive of the New Guinea species collected. Its minute size, massive eyes, mandibles without inner-basal excisions and with fused apical teeth (left mandible only), unsclerotized left paraproct, unclavate left cercus, and the distinctive processes of the tenth abdominal tergite all serve to distinguish the male. The female is readily recognized by the unique coloration of the mid and hind legs, i.e., the unpigmented coxae, trochanters, tibiae, and tarsi which are strongly contrasted by the dark brown femora.

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